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Persistent Varicose Veins with Special Reference to the Varicose Tributaries of the Superficial Femoral and Popliteal Veins

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UNTIL 1954 I regarded varicose veins and ulcers of the leg as clinical entities in themselves, but my horizon was widened when Cockett used the phrase, "the venous disorders of the lower limb", and pointed out that varicose veins, painful legs, swelling, ulceration and eczema are the effects of high pressure in the superficial veins as a result of regurgitation from the deep veins through incompetent perforating veins. Thus the problem of varicose veins and ulceration resolves itself into finding and stopping the leaks between the deep and superficial veins.

Until 1950, three sites of leak were generally recognized; the long sapheno-femoral junction, the short sapheno-popliteal junction, and the ankle perforating veins. In 1951 Dow, in his venographic studies, described a defective calf vein passing obliquely upwards to the popliteal vein and a thigh communicating vein joining the superficial femoral vein. Cockett mentioned large gastrocnemial veins in 1953. Gullmo's (1956) venograms showed varicose tributaries of the popliteal and femoral veins. Although aware that these popliteal and femoral tributaries could be varicose I hope not to meet them, but the persistence of varicose veins after apparently efficient operations drew my attention to their importance. Up to date, I think that the incidence of varicose popliteal and femoral tributaries is about equal, although I have done more operations on the popliteal vein through longer awareness.

The Varicose Tributaries of the Popliteal Vein

In 92 complete operative dissections of the popliteal vein the following have been found:

(a) *The short saphenous vein*.—As Kosinski pointed out in 1926, the termination of the short saphenous vein is variable. It may end in the popliteal space, high in the thigh, or low in the calf.

Popliteal ending.—It ended in the upper part of the popliteal space sixty-seven times—75%, and at the level of the knee-joint five times, making 80% ending in the popliteal space; Kosinski found 67%.

High, or thigh ending.—The short saphenous vein passed through the popliteal space and joined veins in the hamstrings eight times, and the long saphenous once; this equals 10%; Kosinski's was 26%.

Calf, or low ending.—The short saphenous vein ended in the calf five times (6%), including one joining the long saphenous vein below the knee.

In the 92 operations, the short saphenous was normal in 29, and varicose in 63, and of these it was the only varicose vessel in the popliteal space in 10, i.e. there were other varicose tributaries of the popliteal vein in 53 patients.

(b) *The gastrocnemial veins*.—The gastrocnemial veins arise from the inner and outer heads of the muscle. Normally each head gives off two large veins which join the popliteal vein separately at the level of the knee-joint, but they vary as follows:

(1) The veins from one or other head may join the last inch of the short saphenous vein. This was seen seventeen times from each head.

(2) Fairly often one or the other gastrocnemial vein joins the popliteal vein at the same point as the short saphenous vein, helping to form a venous web here.

(3) The veins from each head may join to form a common trunk and either pass into the popliteal vein immediately, or run to the adductor opening before joining. It looks like a double popliteal vein. These variations have each occurred twice.

The vein from the medial head of gastrocnemius is the more often varicose, this having been found fifty-one times, and varicosity of the vein from the lateral head twenty-two times.

(c) *Other varicose veins*.—Indirect varicose tributaries of the popliteal vein are veins which penetrate the popliteal fascia and join either the short saphenous vein towards its end, or one of the gastrocnemial veins. Such a vessel was found twenty-one times.

Veins from semimembranosus, semitendinosus and biceps are rare, but they have been seen to be varicose four times.

(d) *Changes in the popliteal vein.*—The popliteal vein may be obviously inefficient as shown by its bulbous and varicose appearance. It may empty and fill with respiration and be thin-walled. Once it was partly thrombosed, whilst it has been the seat of a sacculated varix the size of a walnut. Occasionally the posterior tibial venæ comites persist into the upper popliteal space.

(e) *The calf communicating vein.*—The calf communicating vein passes from the centre of the calf obliquely through the divisions of gastrocnemius to the popliteal vein at the level of the knee-joint. It has been varicose five times.

(f) *The tibial communicating vein.*—This passes from the anterior vein of the leg through the deep fascia at the upper third of the tibia into the inner head of gastrocnemius, and so to the popliteal vein. This has been varicose five times.

To sum up, in 92 operations on the popliteal space, the short saphenous vein has been varicose sixty-three times and other tributaries eighty-two times; therefore I think that they must be looked for.

Diagnosis

Because these varicose tributaries give symptoms and signs similar to short saphenous varicosity I have formed the habit of calling them pseudo-short saphenous veins. As pseudo-short saphenous veins complicated varicosity of the short saphenous vein in 87% of this series, the signs of short saphenous varicosity are usually present. Pseudo-short saphenous veins are suggested by varicose veins about the leg, calf and popliteal space without the straight trunk of the short saphenous vein being palpable or visible.

The most valuable sign of pseudo-short saphenous varices is to palpate the popliteal space from in front whilst the knee is slightly flexed, as in standing-at-ease. A globular varix may be palpable, possibly with lateral extensions to one or other side of the mid-line. This is often the distended tortuous gastrocnemial vein which at operation may not be visible until the two heads of the muscle are separated.

Isolated varices may be seen entering the popliteal space through one of the grooves behind the knee.

Treatment

I now explore the popliteal vein throughout its course in all cases of short saphenous varicosity. Two incisions are available—an S-shaped and a curved. The S-shaped gives perfect exposure and good healing but is a little tedious to sew up. An incision down the centre of the popliteal space is unwise because a painful, keloid, eczematous or ulcerated scar may follow. Since June 1957 I have used a slightly curved incision about seven inches long centred at the crease of the knee-joint. The upper half is in the inner of the two grooves behind the knee, and the lower part curves gently away to the mid-line of the calf. This has healed well.

Incisions are deepened through the fat and deep fascia and the flaps reflected as necessary until the popliteal space is visible. The short saphenous vein is quickly apparent as it lies under the deep fascia in the mid-line. It is cleared and a constant tributary from the thigh is divided. In 21 out of 90 patients it was also joined by a varicose tributary which had perforated the popliteal fascia and drained varices from the thigh or leg. The sapheno-popliteal junction, usually in the upper part of the space, is sought. It entails dividing the considerable popliteal fat until the medial popliteal nerve is seen as it lies over the popliteal vein. The sapheno-popliteal union is cleared above and below. It is not often that the short saphenous and popliteal veins are alone. Frequently a large varicose trunk from either head of gastrocnemius joins here, and also several other fragile veins. It can be appropriately described as a venous web, and gross hæmorrhage may arise from it.

When the short saphenous vein passes through the popliteal space with no connexion with the popliteal vein it is followed up as high as possible and divided.

Having defined the short saphenous vein and sapheno-popliteal union, the popliteal vein is traced to the lower popliteal space. It is surrounded by the medial popliteal nerve, its sural divisions and branches of the popliteal artery. Under these are the tributaries from gastrocnemius which when varicose may be awe-inspiring. Figs. 1, 2, 3 and 4 were drawn from cases of these pseudo-short saphenous veins. The incompetent veins are divided. After this, the varicose short saphenous trunk is stripped to the ankle.

Varicose Tributaries of the Superficial Femoral Vein

The importance of the varicose tributaries of the superficial femoral vein passing into Hunter's canal was impressed upon me by the persistence of varices after efficient operation on the long saphenous vein. In the early cases of incompetent veins passing into Hunter's canal an incision was made over the suspected vessel to the deep fascia and the vein sought for. This was occasionally unsuccessful and tedious. Later the inner border of sartorius was exposed; this was an improvement and it led to the present practice of seeing the femoral

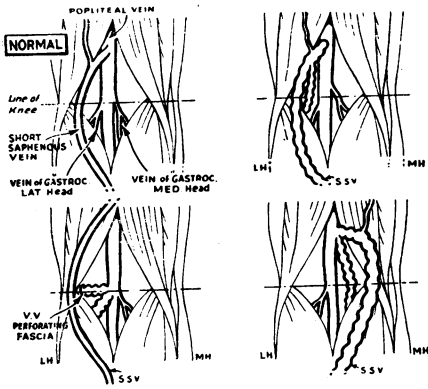


FIG. 1.

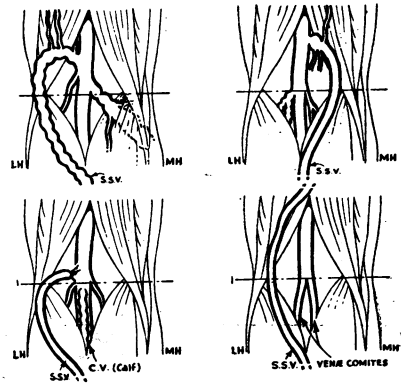


FIG. 2.

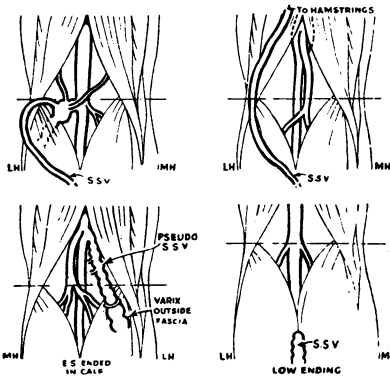


FIG. 3.

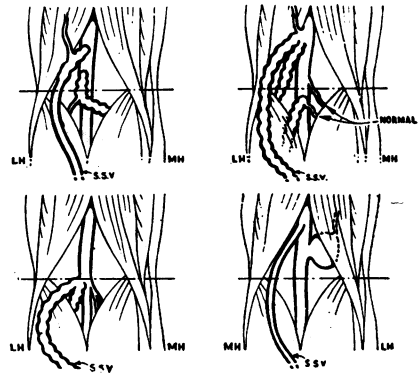


FIG. 4.

FIGS. 1-4.—Diagrams of operations on the popliteal vein and its tributaries. They are converted to the left side for purposes of comparison.

vessels in Hunter's canal, so that the varicose veins can be tied flush on the parent vein as is done for the long and short saphenous veins. This operation has revealed three to four constant small arteries accompanied by venæ comites running medially from the superficial femoral vessels, to the muscles and fat.

They have been found in 30 consecutive dissections of Hunter's canal. In 6 patients a fourth vessel passed through sartorius to the fat. Any of these small veins may become impressively varicose, at times as large as the long saphenous vein. Accurate notes of the varicose findings grew slowly. They are complete in the last 20 operations, in which 10 varicosities were found involving one vessel, and 10 involving two.

Position of the Varicose Veins

The lowest vein in Hunter's canal was varicose fifteen times. These veins either passed inwards or downwards, if downwards they are the descending geniculate vessels (Fig. 5). I have found it is essential to expose the lower end of Hunter's canal where the femoral vessels pass backwards through the adductor opening. The middle vein was defective and enlarged on ten occasions, whilst the upper was affected three times.

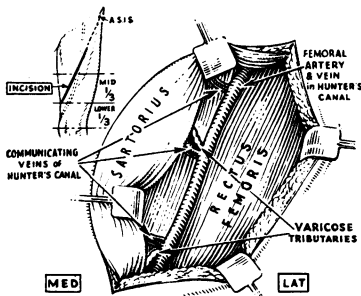


FIG. 5.—The average anatomy of the veins passing into the superficial femoral vein, two are depicted varicose. The inset shows the incision for their exposure.

Venograms indicate that these communicating veins vary in position.

Clinical Presentation

Patients with incompetence of Hunter's canal communicating veins—CV(H)—present either with primary or persistent varicosities. Unlike the varicose tributaries of the popliteal vein, the diagnosis of Hunter's canal veins is straightforward by the tourniquet test. The veins are emptied, tourniquets are applied, one round the groin and the other at the lower third of the thigh, i.e. at the distal end of Hunter's canal. When the patient stands, if the veins remain empty then the short saphenous and ankle communicating veins are efficient; if they fill, appropriate tests for these veins are made. Varicosity of the short saphenous vein is occasionally present with that of the long saphenous vein and Hunter's canal veins, and its state must be determined. If it is varicose then it is kept empty by digital pressure on the centre of the popliteal space while the Hunter's canal veins are assessed. When the

lower thigh tourniquet is removed the veins are watched for twenty seconds. If they fill with an appreciable degree of tension then Hunter's canal communicating veins are incompetent (Fig. 6). The filling is accentuated by asking the patient to stand on the toes twice. The diagnosis of the state of the communicating vein of Hunter's canal is essential not only for cure of the varicosities, but because their treatment requires a considerable incision across the thigh which has cosmetic considerations. I must admit to having occasionally diagnosed them but not found them; I have just undertaken my first persistent case this morning, because the first incision had not been low enough to expose the adductor opening.

The Treatment of Hunter's Canal Communicating Veins

The principle is to expose Hunter's canal fully and to see the veins as they terminate in the superficial femoral vein. The incision occupies almost the lower half of the line joining the anterior superior iliac spine to the adductor tubercle of the femur, as for the classical exposure of the superficial femoral artery (Fig. 5). The skin, fat and deep fascia are divided and it leads to the outer border of sartorius. This muscle is elevated for the length of the wound until its inner border is seen. The three small arteries and their venæ comites run inwards from the femoral vessels. They arise at the upper, middle and lower parts of the canal. One or more of the veins is usually striking in its varicosity and is divided flush on the femoral vein.

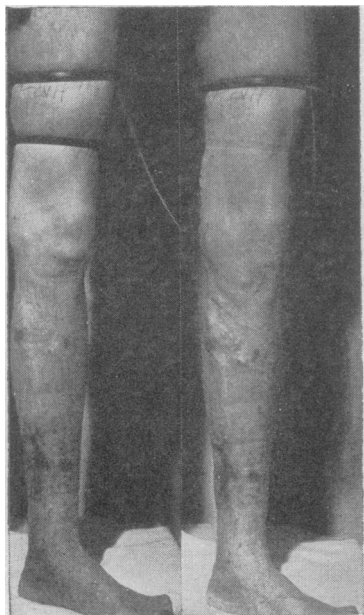


FIG. 6.—The tourniquet diagnosis of a CV(H). Note the healed ulcer and pigmentation associated with it. This patient has an incompetent long saphenous vein also.

CONCLUSIONS

(1) In my experience enough varicose veins have persisted after efficient operations on the long and short saphenous veins to compel me to recognize varicose tributaries joining the superficial femoral vein and the popliteal vein.

(2) As varicose tributaries of the popliteal vein (other than the short saphenous vein) were present in 82 out of 92 cases of exploration of the popliteal vein, I expose this vessel in all cases of apparent short saphenous varicosity. I say "apparent", because a distended vein felt in the popliteal space and considered to be a varicose short saphenous vein has proved to be a gastrocnemial vein on 29 occasions.

(3) The diagnosis of incompetent veins passing into Hunter's canal into the superficial femoral vein is straightforward; I find that they complicate one in four or five cases of long saphenous varicosity. They were associated with ulceration and eczema of the ankle in 35% and 50% respectively.

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Mr. PETER MARTIN showed a film on By-pass Grafting of the Femoro-popliteal Artery for Atherosclerosis.